



REMARKS

Claims 1-31 are pending in the application, with claims 15-29 and 31 being withdrawn pursuant to a restriction requirement. Applicant respectfully requests reconsideration and a withdrawal of all outstanding rejections and objections in view of the above amendments and the following remarks.

Applicant provisionally elected the Group I claims, and the Examiner has indicated that the Office Action is on the merits of claims 1, 3-14 and 30. Applicant is proceeding with the elected claims 1, 3-14 and 30. The Examiner has indicated that claims 1, 3 and 8-14 read on the elected species (and claim 30 also is included as part of the Office Action). Applicant reserves the right to proceed with the non-elected/withdrawn claims, as originally filed and/or amended, in divisional applications, or in the current application, in the event a generic claim is allowed.

Applicant acknowledges that the Examiner has indicated that the species provisionally elected for prosecution by Applicant identified on pages 2-3 of the Office Action was found by the Examiner to be free of prior art.

Applicant thanks the Examiner for his suggestions for the amendment of the title, and accordingly, has amended the title (through the amendment to the specification) to read:

-- Oligomeric Phenazinium Compounds for Electrolytically Depositing Cooper --

A substitute specification showing the changes relative to the prior version is included for the convenience of the Examiner along with an unmarked substitute specification.

Reconsideration of the objection to the title is respectfully requested.

The Examiner has set forth a number of claim objections on pages 5-6 of the Office Action. Applicant has reviewed the objections and has amended the claims accordingly in response thereto. In particular, claim 12 has been amended to more particularly articulate the claimed mixture, and further provides implicit structure, based on the wording of claim 12, that would serve to further define and articulate the mixture. Reconsideration is respectfully requested.

Claims 1, 3-10, 12, 13 and 30 stand rejected under 35 USC 112, first paragraph. The Office Action considers that the specification is enabling for substituted phenazinium salts of the formulae I and II, though not for certain radicals referred to in the Office Action at pp. 6-7, in particular, where independently certain R groups are not -H, -C₁₋₈alkyl, -halogen, -OH, -SH, -Ph or -a single bond, and similarly for certain other R groups (R^{1-4,6-9}, R^{1'-4',6'-9'}, R^{1"-4",6"-9"} and R^{5,5',5"}). This rejection is respectfully but strenuously traversed and reconsideration and a withdrawal of the rejection is hereby respectfully requested.

Applicant's invention is enabled, and the section 112 rejection should be withdrawn. Applicant claims a mixture of oligomeric phenazinium compounds, which, when added to an acidic copper electroplating plating bath, provides improvements in that desired effects are obtained. Applicant's invention discloses and claims oligomeric phenazinium compounds, and discloses and claims a mixture. Applicant submits that the Examiner has not presented proof that the oligomeric compounds disclosed and claimed as part of Applicant's invention, if added to an acidic copper electroplating bath, would not function to achieve the desired results. One of ordinary skill in the art would understand from a reading of Applicant's disclosure that Applicant is claiming a mixture where there are "at least two oligomeric phenazinium compounds". After

all, Applicant's specification refers to Fig. 2 and illustrates the improved levelling effect (compared with Fig. 1), and states that the improved levelling effect is obtained by the mixture of oligomeric phenazinium compounds of the invention. (See [00146], [00147] and [00170] of Applicant's published specification, which corresponds with Applicant's original specification, at page 13, lines 7-18 and page 20, lines 11-13.) One of ordinary skill in the art would understand that a mixture, rather than a single compound, would be obtained in accordance with the Applicant's disclosed invention.

Applicant has amended claim 1 in order to more particularly define the invention by reciting that there is a mixture of oligomeric phenazinium compounds, and that the mixture contains at least two oligomeric phenazinium compounds selected from the group consisting of the compounds recited in claim 1.

The mixture of the oligomeric phenazinium compounds provides oligomerization degrees wherein the compounds differ from each other by the following criteria:

a) oligomerization degree, i.e., dimers, trimers and, to a lesser extent, also higher oligomers;

b) the position in the phenazinium rings where the individual units are coupled together in the oligomers, i.e., whether they are coupled via the 2, 2', 2" or 7, 7', 7" position or via the 1, 1', 1" or 8, 8', 8" position or via any other position available; this of course depends on the position where in the monomeric phenazinium compounds to be reacted together the NH_2 groups are present; but of course, if the positions of NH_2 groups is different on different monomeric phenazinium compounds to be reacted together then there are a plurality of possibilities of coupling these monomeric phenazinium compounds together;

c) the substitution pattern on the individual monomeric phenazinium compounds to be reacted together, if not only one single type of monomeric phenazinium compounds is used, but if instead two or three or even more different monomeric phenazinium compounds are used; for example compounds comprising one first type, one second type and one third type monomeric phenazinium compound; compounds comprising two first type and one second type monomeric phenazinium compounds and the like.

Applicant has amended claim 1 to remove the reference to the $R^{1-4,6-9}$, $R^{1'-4',6'-9'}$, $R^{1''-4'',6''-9''}$ equaling COOH, the COO salt, COO ester, SO₃H, SO₃ salt, SO₃ ester and heteroaryl. Accordingly, these radicals have been defined in accordance with the Examiner's suggestion in the Office Action, and now read as follows:

$R^{1-4,6-9}$, $R^{1'-4',6'-9'}$, $R^{1''-4'',6''-9''}$ = hydrogen, halogen, amino, OH, CN, SCN, SH, C₁₋₈alkyl and phenyl;

$R^{5,5',5''}$ = H, C₁₋₈alkyl or phenyl.

Though the Examiner has indicated that Applicant should delete amino, CN and SCN, Applicant respectfully submits that the specification includes $R^{1-4,6-9}$, $R^{1'-4',6'-9'}$, $R^{1''-4'',6''-9''}$ = amino in the Preparation Examples appearing therein. Consider, for example, the following: Preparation Example 1: reaction of 8,8'-bis-(dimethylamino)-3,3'-dimethyl-10,10'-diphenyl-[2,2']biphenazinylium tetrafluoroborate, 3,8,8'-tris-(N,N-dimethylamino)-8-methyl-5,10',10''-diphenyl-[2,2';7',2'']terphenazine-5,10',10''-ium tetrafluoroborate, 3'-N,N-dimethylamino-3,8'-dimethyl-8-(N-methylamino)-7-oxo-10,5'-diphenyl-5',7'-dihydro-[2,2']biphenazinylium chloride and 3,8'-bis-(N,N-dimethylamino)-8,3'-dimethyl-5,10'-diphenyl-7-hydroxy-[2,2']biphenazinylium tetrafluoroborate, wherein the portions being underlined indicate the residue having amino functionalities. As these amino residues are not

NH₂, but are instead methylated amino, they are not affected during the diazotization reaction to yield diazonium groups, but are still present in the oligomeric compound. Therefore, it would not be appropriate to exclude amino from the definition of R^{1-4, 6-9}, R^{1'-4', 6'-9'}, R^{1"-4", 6"-9"}.

Applicant submits that the inclusion of the amino residues, as recited in amended claim1, is fully supported by the specification and is indeed enabling.

Further, as to R^{1-4, 6-9}, R^{1'-4', 6'-9'}, R^{1"-4", 6"-9"} = CN, SCN, Applicant points out that one must consider that CN and SCN as a residue in the monomeric phenazinium compounds may be obtained with the Sandmeyer reaction via the diazo salt (NH₂ is reacted with CuCN or CuSCN). An intermediary diazonium salt is first formed and, after having split off N₂, the resulting phenazinium cation readily reacts with the CN or SCN, respectively. Such reactions are well-known to a person skilled in the art and work efficiently and without any problem. Therefore, CN and SCN substitutes are likewise easily available to a person skilled in the art so that such person could, at the time the invention was made, manufacture mixtures comprising such phenazinium salts.

For the above reasons, reconsideration and a withdrawal of the section 112 rejection is respectfully requested.

Claims 1, 3-10, 12, 13 and 30 stand rejected under 35 USC 112, second paragraph, as being indefinite. This rejection is respectfully but strenuously traversed and reconsideration and a withdrawal of the rejection is hereby respectfully requested.

Applicant has reviewed the Examiner's rejection and has amended the claims to more particularly articulate the invention. Applicant respectfully disagrees that the claims as

previously presented are not definite, but has made the amendments to recite the language preferred by the Examiner in the Office Action.

Claim 1 has been amended to recite "at least 80 mol% in the mixture". This is supported by the Applicant's specification, which, on page 12 (published specification at [0043]), recites the phrase "is of at least 80 mol % in the mixture". Applicant has amended claim 1 to more particularly articulate the invention by including this language.

Applicant notes the Examiner's indication that the term "amino" in claim 1 appears to be indefinite. Applicant has amended claim 1, and Applicant believes claim 1 to be definite when considering the structure of the claim, namely, see formulae I and II, where the amino radical would appear. The recitation of amino in claim 1 also is consistent with and is fully supported by the Applicant's specification. (See Applicant's specification, at p. 7, lines 10-25, and see e.g., pp. 15-30, which corresponds with the published specification at pars. [0024] and [0054]-[0096].)

The claims also are rejected under § 112 because of the term "a mixture of". Claim 1 has been amended to read "A mixture of oligomeric phenazinium compounds ... containing at least two phenazinium compounds...". A person skilled in the art would know what a mixture of compounds is: it is a composition of compounds where there are at least two different species contained therein. In fact, it will be physical mixture (and not a chemical compound, i.e., a compound of two species bonded together by a chemical bond). The terms "mixture" and "oligomer" are different from one another: The term itself appearing in claim 1, namely "mixture", means that there are different compounds mixed together to form the mixture, not a new compound. The term oligomer means that one or a plurality of different monomers are

reacted together to form a new chemical compound which comprises more than one of the monomer species in this new compound.

For example, the Preparation Examples show that different monomers are reacted together to form oligomers - dimers, trimers and possibly, to a minor extent, also higher oligomers - and at the same time different oligomers are formed which differ from each other and wherein each oligomer is contained in a mixture of all other oligomers.

This is fully supported by the Applicant's specification, see e.g., page 6, lines 15-27, page 8, line 31 to page 10, line 10 and on page 15, line 28 to page 16, line 14, and see the published specification at par. [0021], [0032]-[0036], and [0057].

Accordingly, the phrase "A mixture of" is part of the claim, and provides meaning for the Applicant's claimed invention.

The claims also are rejected under § 112 because the Examiner considers that the definitions COO salt, COO ester, SO₃ salt, and SO₃ ester render the claims indefinite. This rejection is traversed, as these terms have been deleted. Reconsideration is respectfully requested.

The claims are further rejected under § 112 because the Examiner considers that the phrase "an acid anion" would render the claims indefinite. Applicant submits that the type of anion has no effect on the functioning of the invention at all, and the phrase "an acid ion" would be understood to include inorganic and organic anions.

For the above reasons, Applicant respectfully requests reconsideration and a withdrawal of the section 112 rejection.

Claim 11 stands rejected under 35 U.S.C. 102 as being anticipated by Motono et al. (JP 60056086). This rejection is respectfully but strenuously traversed and reconsideration and a withdrawal of the rejection is hereby respectfully requested.

Applicant's invention, as recited in claim 11, is not disclosed or suggested by Motono. Though Applicant's claim 11 refers to a mixture of oligomeric phenazinium compounds ("The mixture of oligomeric phenazinium compounds ..."), Motono et al. do not disclose any oligomeric phenazinium compounds nor do they disclose a mixture thereof. The monomeric fragments defined in claim 11 simply define the oligomeric compounds contained in the mixture as claimed. These fragments are defined to be monomeric units in the oligomeric compounds and not the oligomeric compounds themselves as claimed. Such monomeric units are for example given on page 17, line 22 to page 20, line 9 of Applicant's specification. Combining such monomeric units together, the oligomeric phenazinium compounds contained in the mixture are obtained. Accordingly, the Applicant's invention is neither anticipated by, nor is it obvious in view of, Motono et al. Reconsideration and a withdrawal of the section 102 rejection is respectfully requested.

For the same reasons as those set forth above, Applicant also respectfully traverses the terminal disclaimer requirement, as it would appear to be moot.